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Indian Standard

GLOSSARY OF TERMS
RELATING TO COPPER AND COPPER ALLOYS

PART 1 MATERIALS

(*Third Revision*)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

GLOSSARY OF TERMS RELATING TO COPPER AND COPPER ALLOYS

PART 1 MATERIALS

(Third Revision)

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(Continued on page 2)

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Indian Standard

GLOSSARY OF TERMS RELATING TO COPPER AND COPPER ALLOYS

PART 1 MATERIALS

(Third Revision)

0. FOREWORD

0.1 This Indian Standard (Part 1) (Third Revision) was adopted by the Indian Standards Institution on 30 October 1986, after the draft finalized by the Copper and Copper Alloys Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 IS : 3288 (Part 1) covering terms for cast form and wrought form (main) was first published in 1965 and subsequently revised in 1973 and 1981. While reviewing the standard, the Sectional Committee decided to revise Part 1 and issue 7 more parts for making glossary more comprehensive by modifying the definition of several terms and by including many more terms commonly used in copper industry. The parts are:

- Part 1 Materials (*third revision*)
- Part 2 Unwrought and cast form
- Part 3 Wrought form
- Part 4 Processing
- Part 5 Heat treatment
- Part 6 Finishes
- Part 7 Dimensional surfaces and structural characteristics
- Part 8 Packing

0.3 This standard is intended mainly to cover technical definitions of terms relating to copper and copper alloys, and it does not necessarily include all the legal meanings of the terms. It is hoped that this standard will help in establishing a generally recognized usage for various terms encountered in the copper industry and eliminate any

confusion which may sometimes arise due to individual interpretation of terms used in the industry.

0.4 In the preparation of this standard, assistance has been derived from the following:

- a) ISO 197 — Copper and copper alloys — Terms and definitions

ISO 197/1-1983 — Part 1 Material

ISO 197/2-1983 — Part 2 Unwrought products (Refinery shapes)

ISO 197/3-1983 — Part 3 Wrought products

ISO 197/4-1983 — Part 4 Castings

ISO 197/5-1980 — Part 5 Methods of processing and treatment

Issued by the International Organization for Standardization (ISO).

- b) BS 1420 : 1965 Glossary of terms applicable to wrought products in copper, zinc and their alloys, issued by the British Standards Institution, London.
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1. SCOPE

1.1 This standard (Part 1) defines terms used for material in the field of copper and copper alloys.

2. GENERAL TERMS AND DEFINITIONS

2.1 Alloy — A metallic substance consisting of the basic element (the element predominating by mass) and alloying elements.

2.2 Alloying Element — Metallic or non-metallic elements added to or retained in the basic metal for the purpose of giving that metal certain special properties.

2.3 Impurity — Metallic or non-metallic elements present but which are not intentionally added to or retained by a metal.

2.4 Wrought Alloy — An alloy primarily intended for the production of wrought products by hot and/or cold plastic deformation.

2.5 Casting Alloy — An alloy primarily intended for the production of castings.

2.6 Master Alloy — An alloy intended only for addition to a melt to adjust composition.

2.7 Heat-treatable Alloy — An alloy capable of being changed in its properties by suitable thermal treatment.

2.8 Non Heat-treatable Alloy — An alloy strengthened by cold working only and incapable of being substantially strengthened by thermal treatment.

3. SPECIFIC TERMS AND DEFINITIONS

3.1 Unrefined Copper

3.1.1 Copper Matte — An intermediate product consisting mainly of ferrous and cuprous sulphides, which is oxidized in convertors to produce metallic copper, usually termed blister copper.

3.1.2 Black Copper — An impure form of copper produced by smelting impure copper scrap and/or oxidized copper ores, usually in a shaft furnace.

3.1.3 Blister Copper — An impure form of copper produced by blowing air through molten copper matte. During the conversion process sulphur, iron and other impurities are oxidized. The copper content is normally above 96 percent.

3.1.4 Cement Copper — An impure, finely divided mixture of copper and copper oxide obtained by precipitation of copper usually by iron (cementation) from aqueous solution of copper compounds. The copper content, dry basis, varies widely, usually 50 percent and above.

3.2 Types of Copper

3.2.1 Oxygen-Free Copper — Copper containing less than 10 ppm oxygen.

3.2.2 Tough Pitch Copper — Copper containing less than 0.06 percent oxygen, either electrolytically or fire refined, cast in the form of refinery shapes, containing a controlled amount of oxygen for the purpose of obtaining a level set in the casting. By extension, the term is applicable to fabricators products made therefrom.

3.2.3 Electrolytic Copper (ETP) — Copper, of any origin, refined by electrolytic deposition. Usually when this term is used alone, it refers to electrolytic tough pitch copper. This designation applies to the following.

3.2.3.1 Cathodes, that are the direct products of refining operation.

3.2.3.2 Electrodeposited copper, cast from melted cathodes into refinery shape, suitable for hot or cold working or both and by extension, fabricators products made therefrom.

3.2.3.3 Electrodeposited copper, cast into ingot or ingot bar, suitable for remelting.

3.2.4 Fire-Refined Copper — Copper of any origin or type, finished by furnace refining. Usually when the term 'fire refined copper' is used alone, it refers to fire-refined tough pitch copper. This designation applies to the following:

- a) Copper cast in the form of refinery shapes suitable for hot or cold working or both, and by extension, fabricators' products made therefrom (FRTP-1).
- b) Ingot or ingot bar suitable for remelting (FRTP-2).

3.2.5 Fire-Refined High Conductivity Copper (FRHC) — Copper which, in the annealed condition, has a minimum electrical conductivity of 100 percent of International Annealed Copper Standard (IACS).

3.2.6 Deoxidized Copper — Copper cast in form of refinery shapes, produced free from cuprous oxide through the use of deoxidizers. By extension, the term applies to fabricators' products made therefrom.

3.2.6.1 Deoxidized Copper High Residual Phosphorus (DHP) — Copper deoxidized by phosphorous, usually residual in excess. It is not susceptible to hydrogen embrittlement but is of relatively low electrical conductivity due to the amount of phosphorus present.

3.2.6.2 Deoxidized Copper Lower Residual Phosphorous (DLP) — Copper deoxidized by phosphorous, usually has residual in small quantity. It is not susceptible to hydrogen embrittlement and has electrical conductivity of 90 percent IACS.

3.2.7 Arsenical Tough Pitch Copper (ATP) — Copper containing arsenic in amounts as agreed to between the supplier and the purchaser, and are produced tough pitch variety.

3.2.8 Phosphorus Deoxidized Arsenical Copper (DPA) — Copper deoxidized by phosphorus and containing arsenic in amounts as agreed to between the supplier and the purchaser.

3.3 Method of Refining — The types of copper listed under 3.2 originate from one or more of the following refining methods.

3.3.1 Electrolytic Refining — A process to purify copper by electrolytic desposition using soluble anodes.

3.3.2 Electro-winning — A process to produce copper by electrolytic deposition from an electrolyte using insoluble anodes.

3.3.3 Fire Refining — A process to refining copper by oxidation and subsequent reduction in the molten state.

3.4 Copper Alloys

3.4.1 Brass — Any copper alloy with zinc as the principal alloying element with or without small quantities of some other elements.

3.4.2 Bronze — A term originally used for referring to copper alloys having tin as the only or principal alloying elements. In modern usage the term 'bronze' is seldom used alone; and the term 'Phosphor Bronze' or 'Tin Bronze' is used for indicating copper-tin alloys. In fact, the term 'Bronze', together with a suitable qualifying adjective has, in recent years, been intended to apply to any of a great variety of copper alloys.

3.4.3 Nickel-Silver — Copper alloy containing nickel and zinc, sometimes called German Silver.

3.4.4 Cupro Nickel — A copper alloy composed of copper and nickel with small addition of elements such as iron and manganese.

3.4.5 Aluminium Bronze — Alloys of copper and aluminium, with or without other element when other elements are present, aluminium predominates by mass over each of other elements.

3.4.6 High Copper — Copper containing very low percentage of alloying elements say up to about 2 percent.

INTERNATIONAL SYSTEM OF UNITS (SINUITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane Angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	$1 \text{ N} = 1 \text{ kg.m/s}^2$
Energy	joule	J	$1 \text{ J} = 1 \text{ N.m}$
Power	watt	W	$1 \text{ W} = 1 \text{ J/s}$
Flux	weber	Wb	$1 \text{ Wb} = 1 \text{ V.s}$
Flux density	tesla	T	$1 \text{ T} = 1 \text{ Wb/m}^2$
Frequency	hertz	Hz	$1 \text{ Hz} = 1 \text{ c/s (s}^{-1}\text{)}$
Electric conductance	siemens	S	$1 \text{ S} = 1 \text{ A/V}$
Electromotive force	volt	V	$1 \text{ V} = 1 \text{ W/A}$
Pressure, stress	pascal	Pa	$1 \text{ Pa} = 1 \text{ N/m}^2$

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